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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,580	01/22/2002	Jin-Yuan Lee	MEGP0003USA	6089
27765 7590 05/14/2008 NORTH AMERICA INTELLECTUAL PROPERTY CORPORATION P.O. BOX 506 MERRIFIELD, VA 22116				
EXAMINER MITCHELL, JAMES M				
ART UNIT 2813		PAPER NUMBER		
NOTIFICATION DATE 05/14/2008		DELIVERY MODE ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

winstonhsu.uspto@gmail.com
Patent.admin.uspto.Rcv@naipo.com
mis.ap.uspto@naipo.com.tw

Office Action Summary

Application No.

10/055,580

Applicant(s)

LEE ET AL.

Examiner

JAMES M. MITCHELL

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 92,97,99,101,104,106-109,118,120-129,151,152 and 154-164 is/are pending in the application.
- 4a) Of the above claim(s) 124 and 155 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 92,97,99,101,104,106-109,118,120-123,125-129,151,152,154 and 156-164 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-813)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

This office action is in response to applicant's request for continued examination filed February 21, 2008.

Specification

Claims 124 and 155 are objected to because of the following informalities: the claim status identifier is incorrect. Although applicant has amended withdrawn claims to require the features of the nonelected claim, rejoinder can only take place once the elected claims are in condition for allowance. See M.P.E.P sections 821.04[R-3] and 821.04(a)[R-5]. The correct status identifier for an amended withdrawn claim is (withdrawn-currently amended). Appropriate correction is required. See 714 [R-6]. In the future, amendments without proper claim identifiers will be treated as nonresponsive.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the metal layer between the pillar and pad being formed both on a second region of the pad, under a passivation layer and under the first and third regions of the pad must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure

Art Unit: 2813

number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 92, 97, 99, 101, 104, 106, 107-109 and 118 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no support in applicant's original disclosure for a metal layer between the pillar and pad being formed both on a second region of the pad and under a passivation layer and under the first and third regions of the pad.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 120-123, 126-129 and 163 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) in combination with Ohuchi (U.S. 2002/0033525).

Morrell (e.g. Fig. 3, 4) discloses:

(cl. 120) A bonding structure on a chip comprising a pad (16) having a top surface (e.g. plane mechanically contacting 50) with a first region (e.g. left portion, 16, under 46), a second region (e.g. right portion, 16, under 46), and a third region between said first and second regions (e.g. center portion contacting 20), and a passivation layer (46) on (e.g. covering) said first and second regions, wherein an opening in said

Art Unit: 2813

passivation layer is over said third region and exposes said third region: a metal layer (50) on said third region, over (e.g. above) said passivation layer and over said first and second regions; a copper pillar (24; Col. 2, Line 16-19) on said metal layer, over said passivation and over said first and second regions; over said pad; and a tin containing cap (30; Col. 3, Lines 51-53 & 65-66) over said copper pillar; said cap having a first vertical thickness less than a second vertical thickness of said copper pillar (e.g. Fig. 3); (cl. 121) said tin cap is directly on said copper pillar (Fig. 3); (cl. 123) the metal layer comprises titanium (Col. 3, Lines 1-8); (cl. 126) a conductive layer (162) between said copper pillar and tin cap (e.g. 130) wherein a second vertical thickness is greater than a third vertical thickness of the conductive layer; (cl. 127) the metal layer comprises titanium-tungsten (Col. 3, Lines 1-8); (cl. 128) the metal layer comprises copper (Col. 3, Lines 1-8); (cl. 129) the tin cap has a melting point less than that of said copper pillar (Col. 4, Lines 4, Lines 1-3).

Morrell discloses the same invention as claimed except that its tin cap comprises lead instead of silver or copper. Ohuchi (Par. 0044) shows that Sn/Pb and Sn/ Ag produce equivalent structures known in the art. Therefore, because these materials are art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute Sn/Ag for Sn/Pb.

Furthermore, Sn/ Ag is a known material for providing eutectic solders as exemplified by Ohuchi (Par. 0044). As such, it would have been obvious to one of

ordinary skill in the art to select either Sn/Ag as an alternate eutectic solder, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

With respect to claim 122 that the cap has a thickness across axis of the body and therefore a traverse dimension less than that of the copper pillar, applicant has not disclosed that the selected dimension is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. As such, the selected dimension would have been obvious to one of ordinary skill in the art, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

With respect to the process limitation of claim 163 that the copper is electroplated, the prior art forms the same structure as claimed. Although Morrell discloses plating of its pillar (Col. 3, Lines 24-26), claim 163 is a product-by-process therefore patentability does not depend on its process. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or

obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In *re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

Claim 125 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) and Ohuchi (U.S. 2002/0033525) as applied to claim 120 and further in combination with Fang (U.S. 2002/0095784).

Neither Morrell or Ohuchi disclose that its metal layer is chromium

Fang teaches use of chromium metal layer (“UBM”; 308; Par .0029).

Because use of chromium is known in the art for providing underlying metal layers, it would have been obvious to one ordinary skill in the art to select the claimed material, since it has been held that the selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Claims 151, 152, 154, 157, 159-162 and 164 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571).

Morrell (e.g. Fig. 3, 4) discloses:

(cl. 151) A bonding structure on a chip comprising a pad (16) having a top surface (e.g. plane mechanically contacting 50) with a first region (e.g. left portion, 16, under 46), a second region (e.g. right portion, 16, under 46), and a third region between said first and second regions (e.g. center portion contacting 20), and a passivation layer

Art Unit: 2813

(46) on (e.g. covering) said first and second regions, wherein an opening in said passivation layer is over said third region and exposes said third region: a metal layer (50) on said third region, over (e.g. above) said passivation layer and over said first and second regions; a copper pillar (24; Col. 2, Line 16-19) on said metal layer, over said passivation and over said first and second regions; over said pad; and a tin containing cap (30; Col. 3, Lines 51-53 & 65-66) over said copper pillar; said cap having a first vertical thickness less than a second vertical thickness of said copper pillar (e.g. Fig. 3); (cl. 152) said tin cap is directly on said copper pillar (Fig. 3); (cl. 154) the metal layer comprises titanium (Col. 3, Lines 1-8); (cl. 159) a conductive layer (162) between said copper pillar and tin cap (e.g. 130) wherein a second vertical thickness is greater than a third vertical thickness of the conductive layer; (cl. 160) the metal layer comprises titanium-tungsten (Col. 3, Lines 1-8); (cl. 157, 161) the metal layer comprise copper (Col. 3, Lines 1-8); (cl. 162) the tin cap has a melting point less than that of said copper pillar (Col. 4, Lines 4, Lines 1-3).

With respect to claim 151 that the cap has a thickness across axis of the body and therefore a traverse dimension less than that of the copper pillar, applicant has not disclosed that the selected dimension is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. As such, the selected dimension would have been obvious to one of ordinary skill in the art, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations

Art Unit: 2813

are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

With respect to the process limitation of claim 164 that the copper is electroplated, the prior art forms the same structure as claimed. Although Morrell discloses plating of its pillar (Col. 3, Lines 24-26), claim 163 is a product-by-process therefore patentability does not depend on its process. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

Claim 156 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) as applied to claim 151 and further in combination with Fang (U.S. 2002/0095784).

Morrell does not disclose that its metal layer is chromium

Fang teaches use of chromium metal layer ("UBM"; 308; Par .0029).

Because use of chromium is known in the art for providing underlying metal layers, it would have been obvious to one ordinary skill in the art to select the claimed material, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Claim 158 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) as applied to claim 151 and further in combination with Ohuchi (U.S. 2002/0033525).

Morrell discloses the same invention as claimed including a copper layer over Sn/Pb. This is the same as the claimed invention except that its tin cap comprises lead instead of silver.

Ohuchi (Par. 0044) shows that Sn/Pb and Sn/ Ag produce equivalent structures known in the art. Therefore, because these materials are art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute Sn/Ag for Sn/Pb.

Furthermore, Sn/ Ag is a known material for providing eutectic solders as exemplified by Ohuchi (Par. 0044). As such, it would have been obvious to one of ordinary skill in the art to select Sn/Ag as an alternate eutectic solder, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945)

Response to Arguments

Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection. However to expedite prosecution, examiner has addressed some limitations that may be relevant. Applicant contends that his process imparts structural differences. However, even if the limitation was not disclosed by the prior art, because applicant's remarks amount to mere conjecture it is insufficient to overcome examiner's prima facie case. See M.P.E.P 2145 (The arguments of counsel cannot take the place of evidence in the record; In re Schulze, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965); In re Geisler, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997) ("An assertion of what seems to follow from common experience is just attorney argument and not the kind of factual evidence that is required to rebut a prima facie case of obviousness."))

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art discloses in: Sakurai et al. (U.S. 2001/0040290) and Agarwala et al. U.S. 5,130,779) use solder formed on copper pillar.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES M. MITCHELL whose telephone number is (571)272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone

Art Unit: 2813

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

May 11, 2008

/James M. Mitchell/

Primary Examiner, Art Unit 2813